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THE KUPOL MINE: A POSSIBLE ANALOG OF A MARS OR MOON OUTPOST ON EARTH

Abstract

In anticipation of manned missions to Moon and Mars, proper attention is being given to simulations in extreme conditions on Earth that are similar to alien environments, like deserts or isolated areas.

This paper intends to analyze the Kupol mine as a key analog environment for studying and simulating a future Moon or Mars city. The Kupol mine is located on isolated land accessible mainly by air, in the Far East of Russia, 330 km from Pevek. It is centered within a 10 km wide caldera of volcanic origin. The mine employs 600 workers, who live and work in the camp with rotations of four or six weeks on and four weeks off. Like a small city, the camp provides everything, including facilities and places for social and leisure activities such as a sports hall, pool tables, a music room, a library, a prayer room, and a video library. It includes comprehensive environmental management systems (EMS) and dedicated staff for monitoring their operation. Water and waste management plans are in place and autonomous. Kupol is subject to extremely severe weather: the average annual temperature ranges from -58C to 33C. This is very similar to Mars, where the average temperature is -63C (North Pole) to 30C (South Pole). For approximately two thirds of the year, Kupol is completely white, covered by snow and shaped by strong winds.

There are issues in terms of detecting and understanding the needs for a Moon and Mars mission, not only regarding the technical and engineering design, but also social and cultural aspects including community life and ethnographic analysis dimensions. Human-related aspects including human-computer interaction, knowledge transfer and dissemination, crisis resource management, leisure time, trading, economic and financial aspects, social hierarchy, human factors, resources, and flexible organizational management are part of the design for the survival of a human community in permanently extreme conditions. Given the peculiar conditions of the mining community of Kupol in Siberia, some comparisons will be sketched to get a better understanding of the conditions of an isolated human community on Moon or Mars might face. Focused interviews with the mine manager and workers will be presented together with a comprehensive study of the role and importance for space application. In conclusion, the Kupol data will help the authors to develop, in a further step, a scenario for a possible first future city on Mars and on the Moon.